

"Environmental worries have been at the forefront in recent years, reflecting a sense that climate change-related risks have moved from hypothetical to certain because insufficient action has been undertaken to address them."

The Global Risks Report 2016, World Economic Forum



Growing business value in an environmentally challenged economy

Natural capital data informs business
questions along the value chain

Failure of climate change mitigation and adaptation is the number one impact to global risk, according to the World Economic Forum's 2016 Global Risks Report.¹ Other environmental and social risks rated as highly impactful or highly likely, including extreme weather events, water crises, food crises and biodiversity loss, are closely linked to climate change in the report. And all of these risks are mapped regionally, with some of the most severe faced by our most productive – and vulnerable – regions.

The risk to business value is already visible in volatile commodity markets, profit warnings, disrupted operations and stranded assets. But where there is risk, there is opportunity. Business leaders are already acting to create value in an environmentally challenged economy by building resilience, capitalizing on green markets and seizing circular economy opportunities.

The economics of environmental risk

Between 2009 and 2011 the price of cotton leapt by 450%; in 2015 the price of oil collapsed by 49%.

The markets for both of these commodities are liquid with thousands if not millions of participants, from financial institutions to companies and their consumers. With all this information driving the price of these commodities, it is remarkable that prices were able to move so dramatically, causing corporate profits to be impacted positively and negatively along value chains.

Now imagine a group of resources that are the most used of all and drive the most value in the economy, but where there are no price setting participants because there is no market. Then think about what the potential is for mispricing and dramatic price volatility of these resources and the implications for business performance. In the most extreme case the resources disappear before the price can move because there is no price signal to curtail demand. That is the precise situation for the vast majority of the world's essential environmental resources, from clean air and fresh water to natural habitats, landscapes and a stable climate.

By understanding the supply, demand and value of the environmental resources that sustain corporate revenues and economic markets, now and into the future, businesses can gain a significant information and therefore competitive advantage.

We use the term natural capital cost to describe the non-market value of the environmental resources that businesses depend on to grow revenue. In this paper, we shed light on the power of natural capital data to provide the insights companies need to build resilience into their value chains and identify tomorrow's sustainable business solutions.

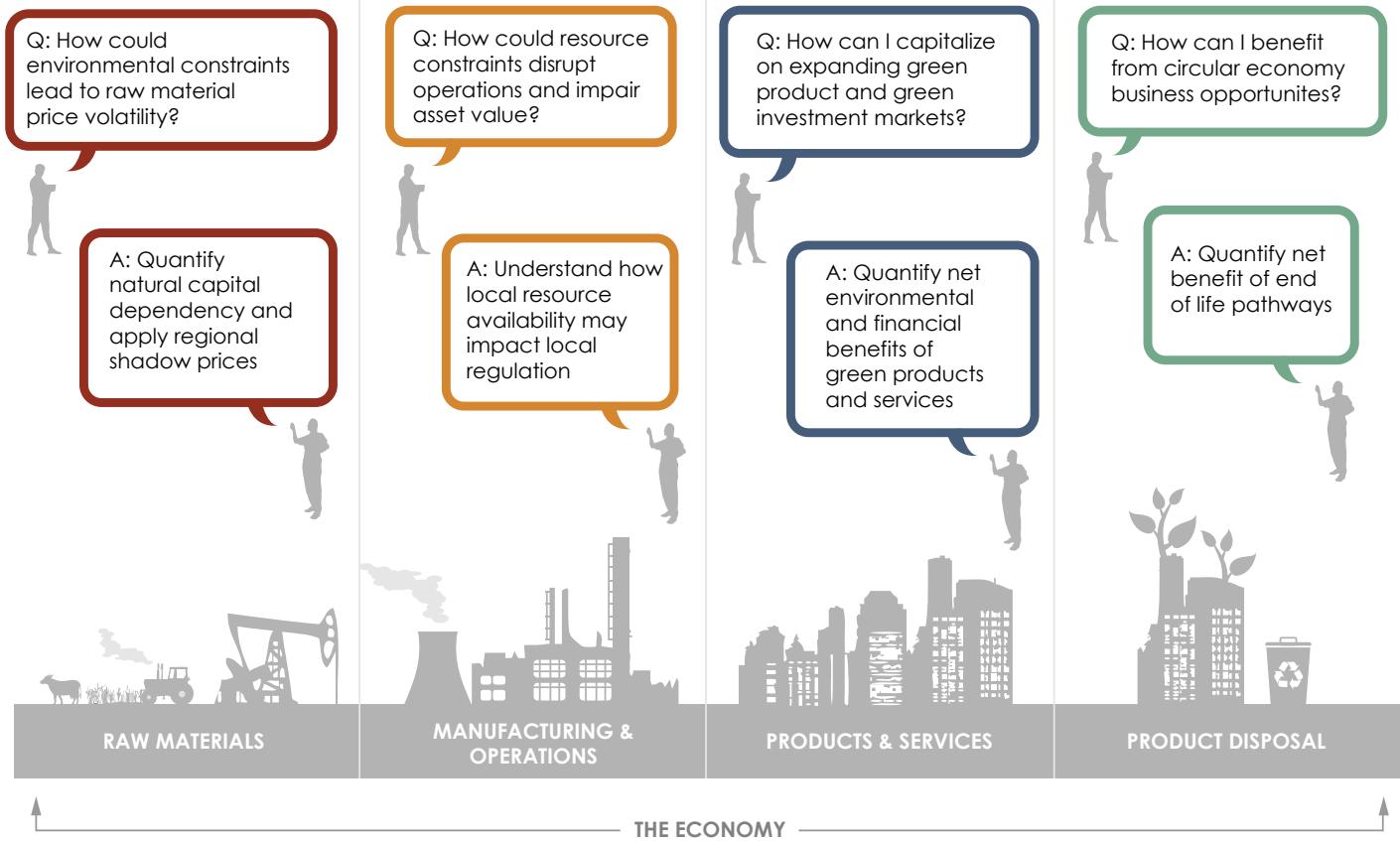
Informing business questions along the value chain

Diverse stakeholders, from regulators to local community groups and nature itself, are exposing the value of constrained environmental resources on company income statements and balance sheets. Companies with growth in mind need to understand the extent to which their ability to achieve revenue targets may be constrained by the potentially rapid, non-linear internalization of natural capital costs through regulation, social campaigns and shortages – and identify alternative strategies to minimize costs and enable growth.

Trucost's natural capital data insights routinely inform key business questions along the value chain by quantifying natural capital costs in different geographical regions.

¹ World Economic Forum (2016), Global Risks Report, available at <http://reports.weforum.org/global-risks-2016/>

FIGURE 1: NATURAL CAPITAL DATA INFORMS BUSINESS QUESTIONS ALONG THE VALUE CHAIN



Source: Trucost

Q: How could environmental constraints lead to raw material price volatility?

We witness intensifying environmental regulations and social pressure to protect vulnerable raw materials, from water and paper to chemicals and metals. The effects of climate change are intensifying with increasingly frequent extreme weather events having a significant impact on agricultural yields and distribution networks. But how are businesses managing the financial risks of increasingly volatile commodity markets, rising environmental costs, and greater exposure to reputational damage?

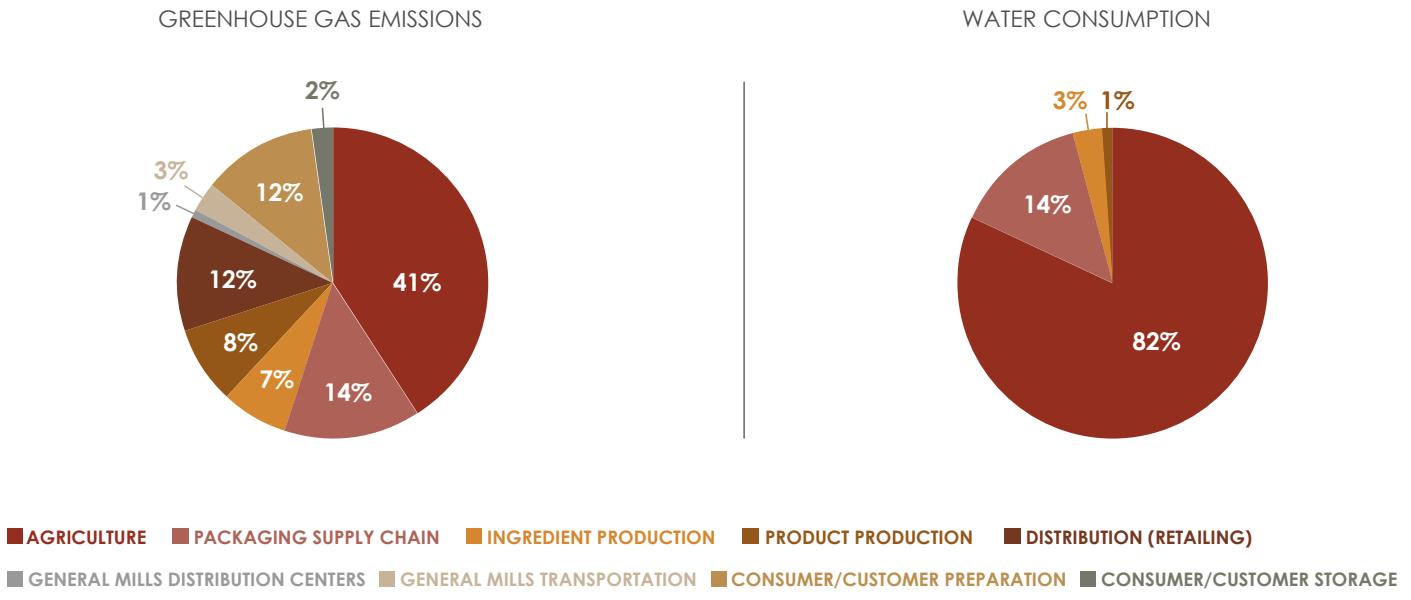
A: Quantify natural capital dependency and apply regional shadow prices

Companies first need to identify the range of environmental issues impacting raw material cost and supply, quantify that risk across different scenarios, geographies and timescales – and develop adaptable management strategies to turn risk into opportunity.

Food retailer General Mills commissioned Trucost to quantify natural capital risks across its value chain including agriculture, ingredient production, packaging supply chain, product production, distribution and consumer use.²

² Trucost (2014), Supply Chain Sustainability, available at <http://www.trucost.com/published-research/145/case-study-general-mills>

FIGURE 2: NATURAL CAPITAL HOT SPOTS IN GENERAL MILL'S VALUE CHAIN (DATA CURRENT AT 2014)



Source: Trucost

"In 2005, we began as most companies do – working within our own four walls. So, we established targets to reduce the environmental footprint within our own factories, working on water, energy, waste, and greenhouse gas, and have made great progress there," says Steve Peterson, Director of Sourcing and Sustainability at General Mills. He continues: "Being a farm kid from Minnesota, the game is 'fish where the fish are.' Really, the sustainability game is upstream from us. Two-thirds of our total product carbon footprint resides upstream with our suppliers, primarily within agriculture. Ninety-nine percent of our water footprint resides there. That's why our focus in the next couple of years is around supplier sustainability and sustainable sourcing."

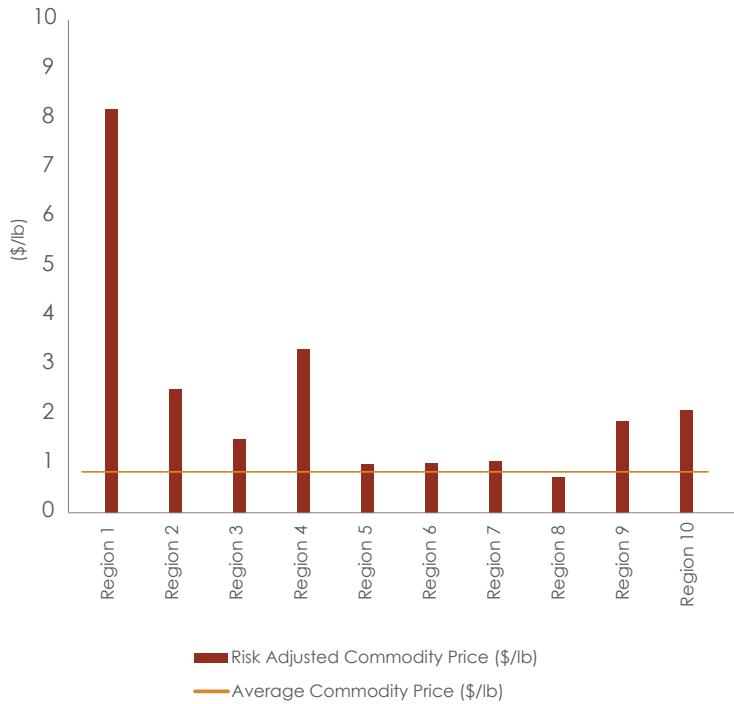
General Mills is now widely recognized for its ambitious plan to reduce greenhouse gas emissions by 28% by 2025 across the company's entire value chain "from farm to fork to landfill".

Having quantified baseline natural capital risks by value chain segment and identified risk indicators and management targets, companies can refine their insights with region-specific natural capital data to inform specific questions.

A leading international fashion brand was concerned about the impact of water shortages on global cotton markets. The company, which depends more on cotton than any other raw material, wanted to inform a resilient sourcing strategy.

Trucost assessed the brand's supply chain financial risk exposure and identified region-specific risk-adjusted commodity shadow prices to inform targeted sourcing strategies. As a result, four key strategies were identified across 50 sourcing regions ranging from 'monitoring water stress increases' to 'targeting and incentivising collective action on water stewardship interventions'.

FIGURE 3: RISK ADJUSTED COMMODITY SHADOW PRICES AND TARGETED SOURCING STRATEGIES



Source: Trucost

Q: How could resource constraints disrupt operations and impair asset value?

More and more companies are accounting for their natural resource use and pollution impacts. By 2014, almost 90% of companies in the MSCI Europe Index had publicly disclosed their carbon footprint.¹ But are companies linking environmental metrics to their forward projections of business growth?

Investors are increasingly asking companies to be clear on how they are managing environmental risks. For example, investors have been putting pressure on vulnerable companies to stress test their business models for climate risks. The fundamental question is, how do companies ensure that they are incorporating material environmental risks and opportunities in business planning and capital allocation?

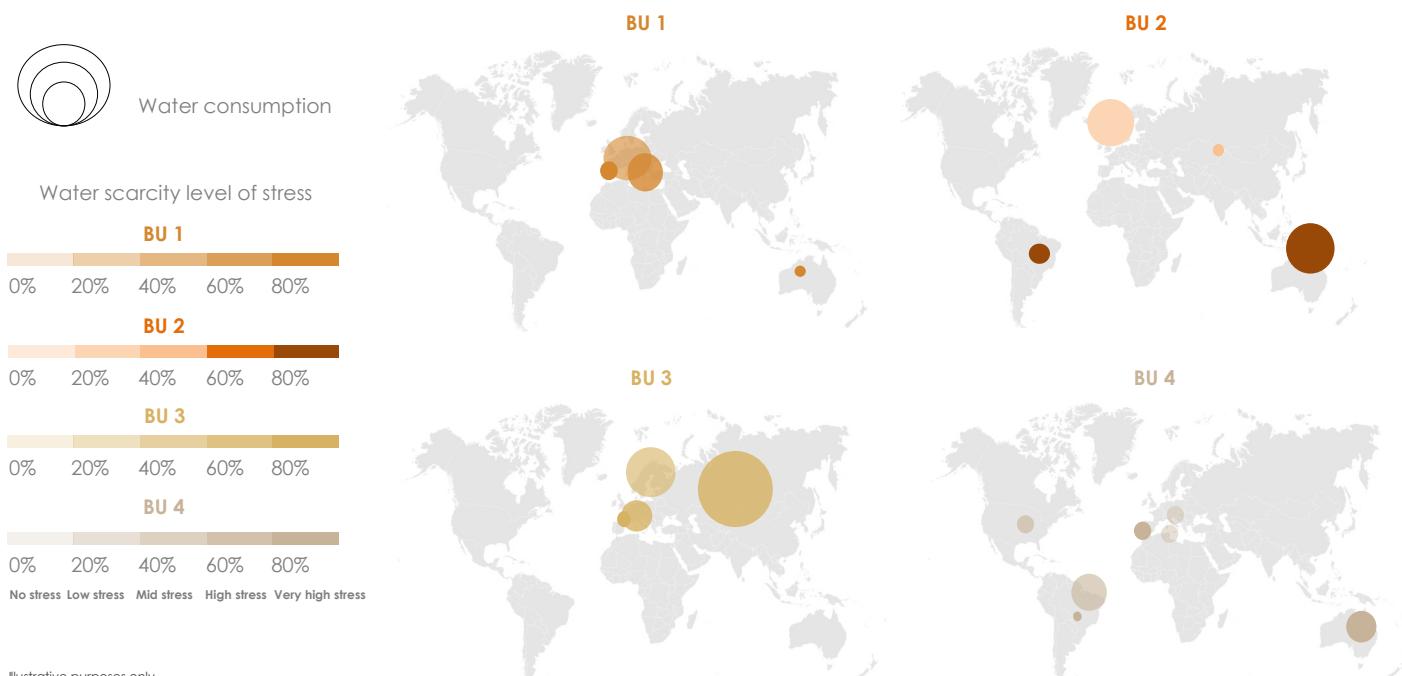
A: Understand how local resource availability may impact local regulation

Companies make long-term capital investments in operations and assets – but to what extent are they integrating future environmentally risks in their strategic plans? Managers should identify the impact of natural capital costs on growth strategies to understand where limits to growth may be imposed by lack of access to resources and determine what action may be required to continue to generate profit in specific regions and locations.

Louis Vuitton Moët Hennessy (LVMH), the luxury products group, was concerned that unknown exposure to water scarcity would affect its ability to operate and could lead to future impacts on profitability. Trucost calculated a region-specific water risk map across the entire value chain and identified regionalized natural capital shadow prices, taking into account local water availability. Finally, Trucost assessed the degree of local regulatory momentum towards increased water tariffs.

Truost's Regulatory Risk Framework combined an evaluation of shadow water costs and the local regulatory climate across LVMH's key sites and raw material inputs. By taking into account both the cost and likelihood of any risk, the framework allows LVMH to prioritize risk management where it most matters and strengthen the business case for investment.

FIGURE 4: REGULATORY RISK FRAMEWORK



Source: Trucost

³ Trucost (2015) Portfolio Carbon Data: The Quality Imperative, available at <http://www.trucost.com/published-research/174/portfolio/carbon/data>

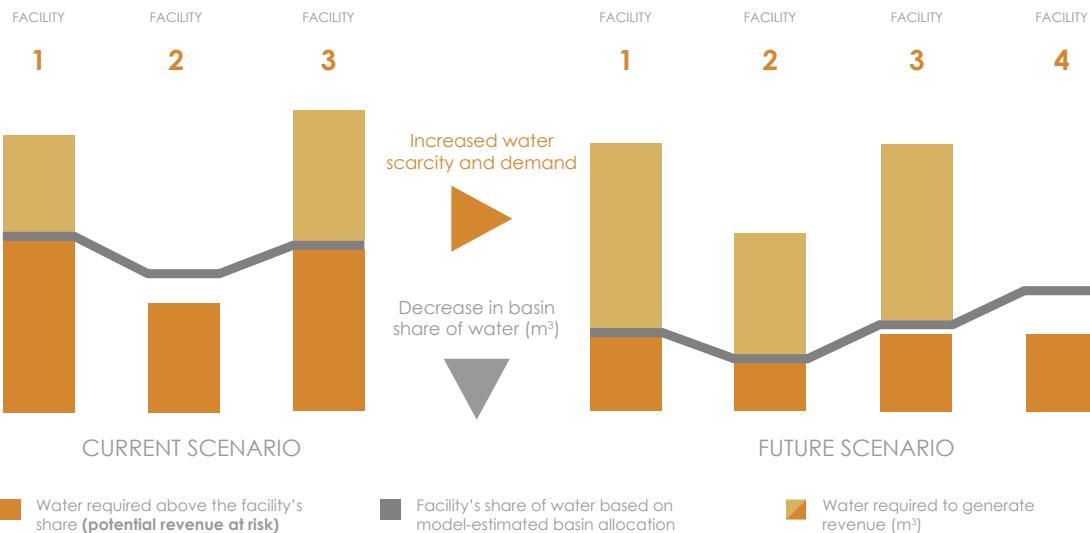
Ecolab, a \$13.5 billion water, hygiene and energy technologies and services provider, wanted to help companies understand the financial risks they are facing from water scarcity, at both site level and across business operations. Water is undervalued in much of the world, making it difficult for water users to understand the full value and inherent risk of water to their business. Trucost and Ecolab partnered to develop the Water Risk Monetizer⁴, a publicly available tool to help companies assess the financial implications of local water scarcity, based on information about their future water use and production capacity.

The Water Risk Monetizer combines Trucost's economic model on industry water use with scientific data on local water availability to calculate a risk premium – or environmental shadow price – to better reflect the value a business should place on water. The tool also calculates potential revenue at risk and scores the likelihood that the company will realize these risks.

One unique aspect of the tool is its ability to assess a facility's risk within the context of other water users in the basin. The tool leverages existing water and financial data alongside scientific methodologies to estimate the amount of water available to a business — its “share” of total water available to all businesses in a water basin — based on the facility's contribution to the local economy. Because water is a shared resource among many users in a basin, it's essential for a business to understand how its allocation may change, and with it any potential for constraints to continued revenue growth. In this way, businesses managers can identify market-based water management targets to inform regional growth plans.

Thousands of companies have used the Water Risk Monetizer since its launch in 2014 to stress test business models, identify high risk assets, suppliers and regions and build the business case for water efficiency where it most matters. “As water scarcity increases around the world, business leaders need actionable information to help them understand and manage their current and future water-related risks,” said Emilio Tenuta, Vice President of Corporate Sustainability at Ecolab. “The Water Risk Monetizer helps businesses make informed decisions to enable growth in this new era of water scarcity.”

FIGURE 5: THE WATER RISK MONETIZER



Source: Ecolab

⁴ Available at <https://tool.waterriskmonetizer.com/>

Q: How can I capitalize on expanding green product and green investment markets?

Expanding market appetite for greener products goes beyond customers. Investors are making critical commitments to finance sustainable growth from divestment to reinvestment – and a wealth of innovative green finance vehicles are emerging, from carbon efficient indices and funds to green bonds and lending policies. These investors are seeking to invest in the companies that are best prepared for the challenges of the 21st Century, the companies that are best able to create the products that will help drive the transition to a low carbon, resource efficient economy.

A: Quantify net environmental and financial benefits of green products and services

Companies that wish to attract capital should demonstrate the environmental and financial benefits of the enabling technologies, products and services they are producing to a range of stakeholders, including the investment community. Companies will need to identify exactly what the environmental benefit of their product innovation is and how this will enhance returns to shareholders. By integrating natural capital costs in the business case for product design and development companies can join up the environmental and financial business case – and communicate robust environmental and financial benefits of products and services to different audiences, from customers to investors.

EILEEN FISHER, Inc., a women's clothing and accessories company with social consciousness at the heart of its brand, has demonstrated leadership and made headlines in the apparel industry with its public commitment to source 100% organic cotton and linen by 2020.

Trucost found that EILEEN FISHER's organically sourced cotton has natural capital cost benefits 2.5 times greater than conventionally grown cotton, providing science-based rationale and affirming EILEEN FISHER's strategy to source organic fibers.

That less than 1% of global cotton production is organic creates familiar challenges for companies like EILEEN FISHER that set ambitious environmental goals: when supply is limited, prices go up. "As a company we ask ourselves, how long will this style last? Is the fabric sustainable? Does it cost too much? Will it sell? It's this constant balance between making things work for the business, the customer and the environment."

By 2015 EILEEN FISHER had already outstripped the market, achieving 88% organic cotton and 72% organic linen across its clothing and accessory lines. The company is actively informing customers about the environmental benefits of organically-grown fibers. For example, its website notes that while the initial cost of organic cotton is more expensive than its conventionally grown counterpart, consumers are making a long-term investment in the environment and human health.

The company is also taking significant steps to minimize other environmental hot spots verified by Trucost's natural capital analysis. For example, it is addressing the natural capital cost of land use in its supply chain – by far its largest natural capital cost – by engaging internal stakeholders and suppliers to ensure its clothing is free from fiber derived from endangered forests and illegal logging. It is also acting to lower supply chain greenhouse gas emissions by reducing its reliance on air shipping. And naturally, these messages are front and center of the company's customer communications: "our mission drives our business and our profitability fosters our mission".

FIGURE 6: EILEEN FISHER'S ORGANIC FABRIC SOURCING

THIS IS NOT A PERFECT PICTURE
ONLY 52% OF THE LINEN IN THIS TUNIC IS ORGANIC. THAT'S GOING TO CHANGE.

By 2020, all our linen will be organic. No synthetic pesticides, no synthetic herbicides. We're committed to using the best ingredients with the least possible impact—from the farm to the factory to your closet.

FOREST CONSERVATION: WE'RE COMMITTED
As part of our broad efforts to map our supply chain, we are committed to understanding the effects of regenerated cellulose fibers—renew, moist and green!—on our supply chain.

WE'RE WORKING ON IT. CHLORINE FREE WOOL
By Eileen Fisher
Each year 20 billion pounds of wool are treated with chlorine to reduce itchiness, shrinkage and pilling. Unfortunately, chlorine leaves harmful byproducts. We're committed to safer chemistry.

WHY WE'RE CHOOSING ORGANIC LINEN
Organic linen is grown without synthetic fungicides, pesticides and herbicides, in fields that are healthier for farmers, wildlife and surrounding communities. By 2020 all our linen will be organic.

Organic Cotton Good Questions

Why should I buy organic cotton?
The bottom line: Organic cotton is grown in a biodiverse, balanced ecosystem. Conventional cotton depletes the environment and leaves behind toxins with long-term effects. With organic cotton, you are paying for clean water, clean air and a healthy environment for workers and wildlife.

How can I tell if cotton is organic?
Unless there's a label, you can't. Strands of conventional, GMO and organic cotton look alike—to the naked eye and under the microscope. "You can't tell the fiber, you have to test the soil," explains Jane Deyer, a cotton breeding specialist at Texas A&M University. "That's why third-party certification is so important."

Is organic cotton better for my health?
Not directly. The idea that organic cotton is better for your skin is a common misconception. The health benefit actually comes at the field level, where farm workers and local communities can be exposed to pesticides, herbicides and defoliants that pollute groundwater. Farm towns do not affect garments that you wear largely because they are applied before the cotton plant produces its white fibrous bolls. Sometimes defoliants can be detected on the raw fiber, but in the course of knitting, dyeing and finishing cotton is washed multiple times.

**NOTICE OF THE ACTION
ORGANIC LINEN**
Do you care how we grow what you wear?
See product for details.

Source: EILEEN FISHER

Ulyx, the energy consultancy division of UK facilities management company MITIE, wanted to engage the responsible investment community with its decentralized energy strategy and tap in to the £110 billion funding required to upgrade the UK's aging infrastructure.

There is increased momentum for investment appraisals to evaluate economic, environmental and social impact, and the UK's Green Investment Bank is one of the leading members of the financial community to use this to evaluate as part of its return and impact on investment. In order to engage these investors and appraisers, Ulyx asked Trucost to compare the net benefits of its decentralized energy center to the UK's centralized energy supply, over the 25-year lifetime of the centre.⁵ Trucost identified that Ulyx's decentralized energy centre provided environmental cost savings of over \$100 million compared to UK grid energy, mainly from avoided greenhouse gas and air pollution impacts. This evidence base enabled Ulyx to successfully demonstrate both the economic and environmental business case of its strategy and secure the funds it required.

Mark Stokes, then managing director of Ulyx Asset Management, said: "To establish a business sustainable evaluation of our energy assets we needed to measure and protect what nature gives us for free and remove that economic invisibility to ensure that future income and growth are sustainable. In monetizing environmental impacts, Ulyx is also future proofing business against future policy and legislative changes which are likely to occur in the coming years such as taxes on carbon, greenhouse gas emissions and other aspects of the ecosystem."

5 Ulyx (2013) Monetising Natural Capital, available at http://www.trucost.com/published-research/133/ulyx_monetisingnaturalcapital

FIGURE 7: THE ASSET ENVIRONMENTAL PROFIT AND LOSS ACCOUNT

Gross environmental cost savings – Whole life (The Asset EP&L)				
		Environmental cost (£)		
Activity	Emission type	Addenbrooke's	Baseline Candidate	Savings
Generation of electricity and heat from Addenbrooke's energy centre	GHG emissions (tCO2e)	2,261,473	4,479,162	55,442,225
	Air pollution (t)	50,393	407,949	8,938,900
	Heavy metals (t) (Operations only) of waste wood	0.2	2,867	71,675
	Water consumption (m3)	6,874	125,280	2,960,175
	Water pollution (tCOD) (Operations only)	15,471	342,55	8,177,075
Energy centre construction	GHG emissions (tCO2e)	660,198	0	-660,198
	Air pollution (t)	110,840	0	-110,84
	Water consumption (m3)	38,133	0	-38,133
Diversion of waste wood from landfill	GHG emissions (tCO2e)	0	173,188	4,329,700
	Air pollution (t)	0	4,496	112,400
	Waste disamenity (t)	0	10,299	257,475
Total		3,143,381	5,545,796	79,480,454

Source: Utilyx

Q: How can I benefit from circular economy business opportunities?

The circular economy, where ultimately all materials are reused or recycled and no waste or pollution is generated, presents high value business opportunities for companies at a time when pollution limits and natural resource scarcity present increasing risk to ‘business as usual’ models.

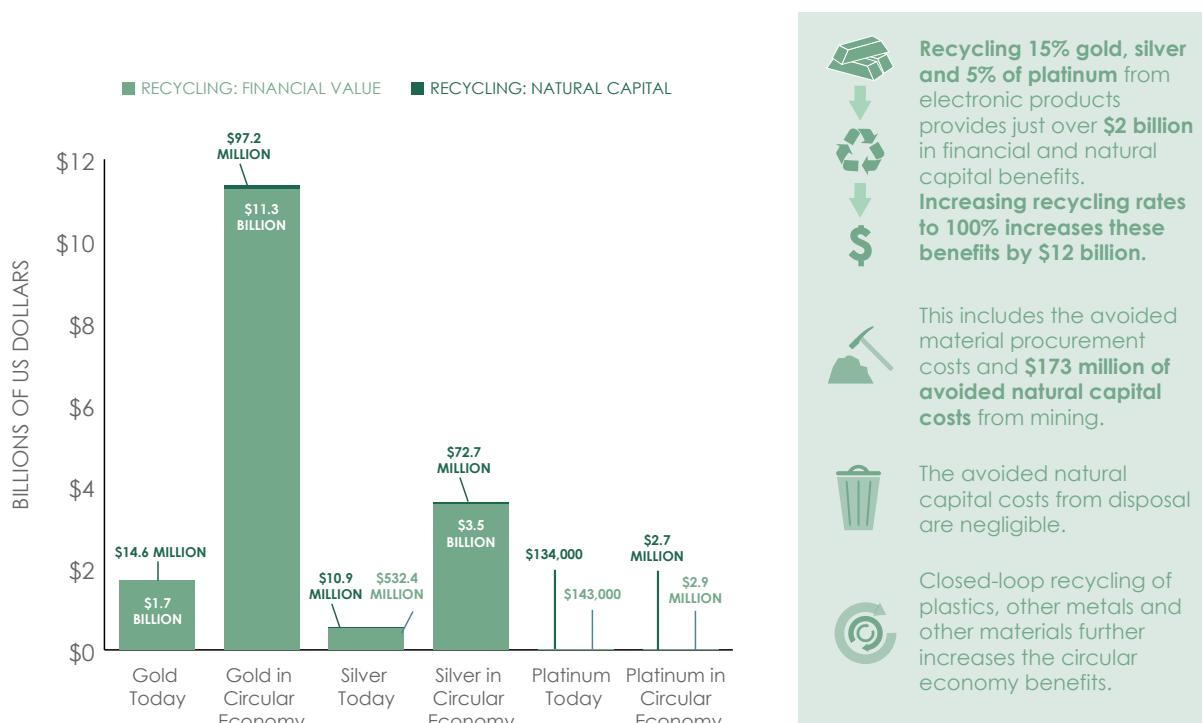
A: Quantify net environmental and financial benefit of end of life pathways

Applying natural capital costs to end of pathway opportunities provides valuable insights to support companies in understanding where in their value chains they can best leverage their attention.

The Green Electronics Council asked Trucost to assess the business case for circular economy practices throughout the electronics sector. Trucost found the industry could achieve a further \$10 billion financial and natural capital cost savings by increasing its recovery of gold, silver and platinum from current rates to 100%.

“The environmental benefits of resource recovery, recycling and reuse are well-documented, and the efficiency gains in those areas have generated significant results,” said Jonas Allen, Director of Communications for the Green Electronics Council. “What we found with Trucost is that there are also financial benefits to embracing a circular economy, which presents a true ‘win-win’ both for the companies that capitalize on the opportunity and for the planet.”

FIGURE 8: CLOSING THE LOOP



Source: Trucost

Global technology leader Dell is also seizing the circular business opportunity by integrating recycled plastic into the design of its OptiPlex 3030 All-in-One desktop computer. What is unique compared to other recycling initiatives is that the recycled plastic comes from used electronic equipment recovered through Dell's own global take-back scheme – ULe certified 'closed-loop' recycling.

"There are significant benefits to embracing a circular economy" said Scott O'Connell, Director, Environmental Affairs at Dell. "Our closed loop plastics supply chain enables a resource-efficient product made from recycled content that costs Dell less. Companies need to realize sustainability programs are just good business."

Dell wanted to demonstrate the huge potential benefit of scaling up closed-loop plastics recycling. It commissioned Trucost to assess the net environmental benefit of closed-loop recycled plastic in terms of lower pollution, reduced greenhouse gas emissions, and improved human health compared to using traditional plastic. This involved quantifying positive and negative environmental impacts and putting a monetary value – natural capital cost – on the result.

The results show that Dell's current usage of closed-loop plastic has a 44% greater environmental benefit compared to virgin plastic, equivalent to an annual saving to society of \$1.3 million in avoided environmental costs. Of critical importance are the reduced human health and ecotoxicity impacts achieved by closed-loop recycling of plastic instead of disposal.

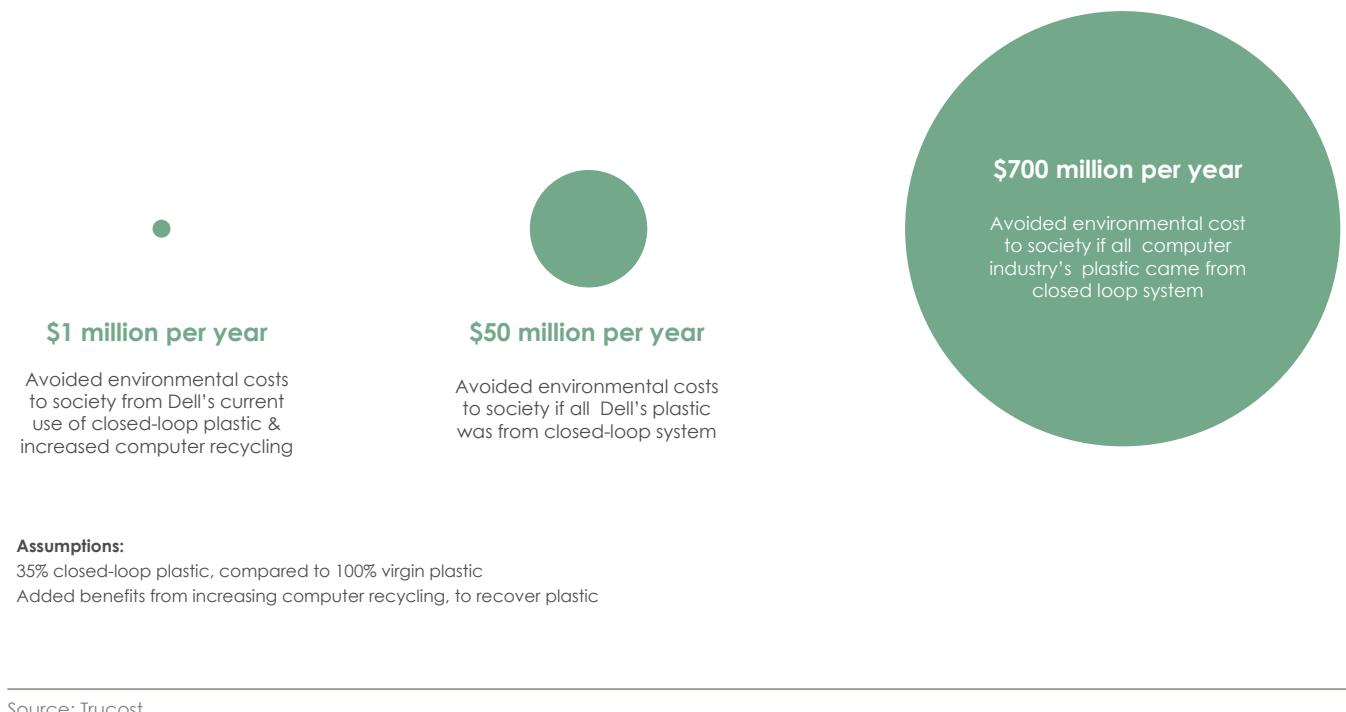
If all of Dell's plastic was supplied by closed-loop recycling, the environmental benefit to society would increase to \$50 million per year. If the entire computer manufacturing industry switched to using closed-loop recycled plastic, the environmental benefit would increase to \$700 million per year.

Dell's net benefit analysis helps make the case for increasing the use of closed-loop recycled plastic both within its own business and across the industry. By switching to a more environmentally beneficial way of manufacturing products in which plastic waste is valued as a useful resource, Dell and the computer industry can take a big leap forward towards sustainability.

"The key to success is to collaborate with stakeholders throughout the process," says Dell senior environmental engineer Puneet Shrivastava. "Dell brings all its 'environmental' stakeholders together in one room to discuss challenges and identify opportunities."

Initiatives such as Dell's closed loop recycled may start in the environmental team, but the challenge needs to be taken up by other people in the company such as marketing and procurement, as well as drawing on expertise from external partners. One of the main continuing challenges is to get more end-of-use materials to recycle which meet the requirements of the new product. Again, collaboration provides the solution. Dell regulatory engineer Stephanie Schafer says: "Conventionally, plastics in electronics may not be salvaged, with more economically attractive components such as hard drives, precious metals and chips driving the process. By working with partners to improve logistics, Dell have achieved a true closed loop system."

FIGURE 9: ENVIRONMENTAL BENEFIT OPPORTUNITY THROUGH SCALING OF CLOSED LOOP RECYCLING



Source: Trucost

Summary

Quantifying the unpaid cost of environmental resource impacts and dependencies – from pollution to natural resources – and integrating location-specific shadow prices in decision making provides vital insights to help companies manage growth and profitability.

A growing number of companies are adopting this approach and putting shadow prices on carbon, air and water pollutants, water use, land conversion and other natural resources to get ahead of the trend towards regulators, society and nature correcting market failures to price constrained environmental resources.

For many, it is a risk management strategy – a way to identify high impact environmental issues, assets, regions and value chain segments – and talk about risk in the language of business: dollars and cents. It's also a way to build the business case for energy efficiency, water conservation and sustainable resource management where it most matters.

Leading companies are taking the insights a step further and using natural capital data insights to inform innovations along the value chain to best position their business for a low carbon, resource efficient future – and demonstrate the shared value they are creating for stakeholders and customers.

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About Trucost

Trucost has been at the forefront of the delivery of natural capital data insights and tools since it began working with its academic advisory panel in 2000 to develop an extensive library of natural capital data and models.

As early as 2010, the United Nations Environment Programme Finance Initiative asked Trucost to calculate the cost of global environmental damage and examine why this is important to the economy, capital markets, companies and investors for a pioneering report ‘Why environmental externalities matter to institutional investors’. Since then Trucost has been hired by more than 200 organisations to apply natural capital accounting insights in different ways to inform different business challenges and opportunities.

Our insights and tools routinely inform key business questions including How could environmental constraints lead to raw material price volatility, disrupt operations and impair asset value? How can I capitalize on expanding green product and green investment markets? How can I benefit from circular economy business opportunities?

In this way we help our clients build resilience and identify innovations to best position their business for a low carbon, resource efficient future. By identifying the avoided cost to society of green strategies and products, we further enable our clients to demonstrate the shared value they are creating for customers and investors.

We are delighted support the important work of the Natural Capital Coalition by contributing to the development of The Protocol and developing implementation Sector Guides for the Apparel and Food & Beverage industries.

Find out more at www.trucost.com

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